NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

MIL-PRF-39016/33E
20 JULY 1988
SUPERSEDING
MIL-R-39016/33D(EC)
13 March 1984

PERFORMANCE SPECIFICATION SHEET

RELAYS, RADIO FREQUENCY (COAXIAL), ESTABLISHED RELIABILITY, ELECTRICAL, HERMETICALLY SEALED, SPDT AND DPDT, DC TO 1 GHz

(E) This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification and the latest issue of MIL-R-39016.

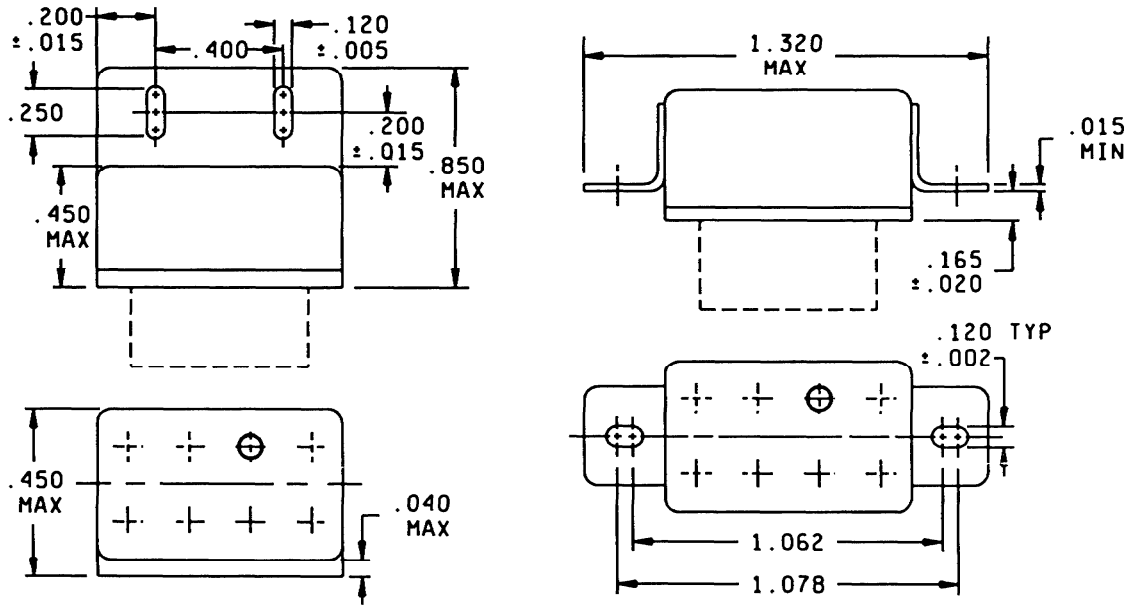
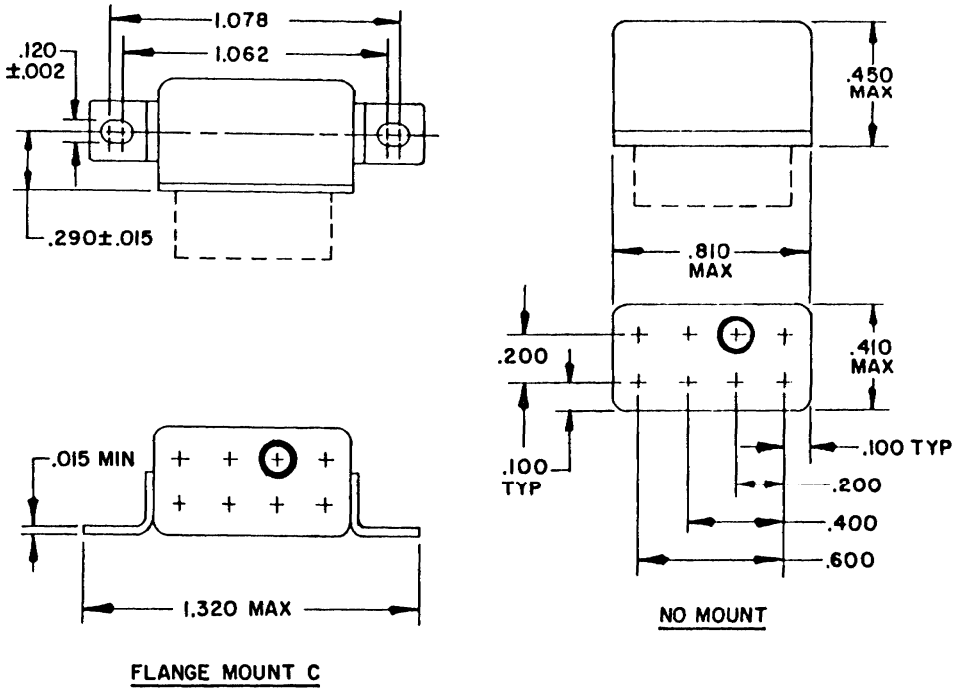
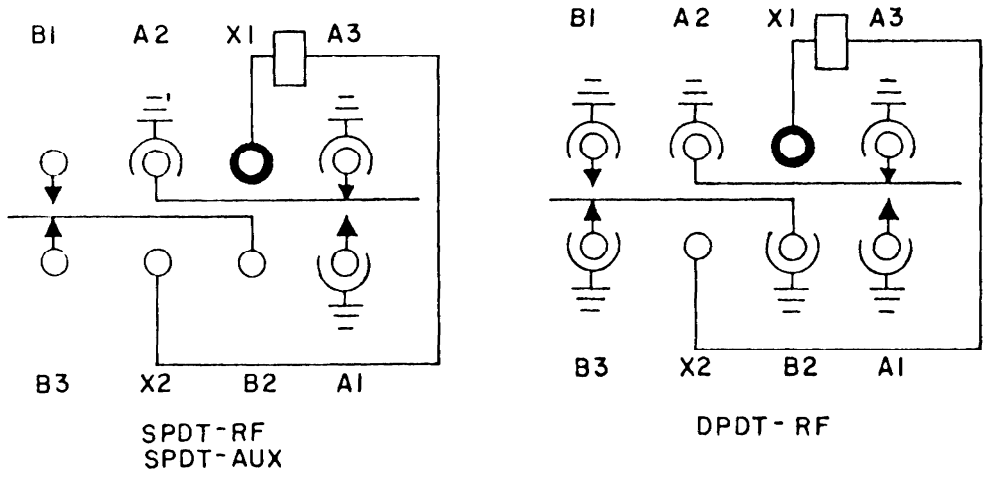


FIGURE 1. Outline dimensions and configuration of relay.

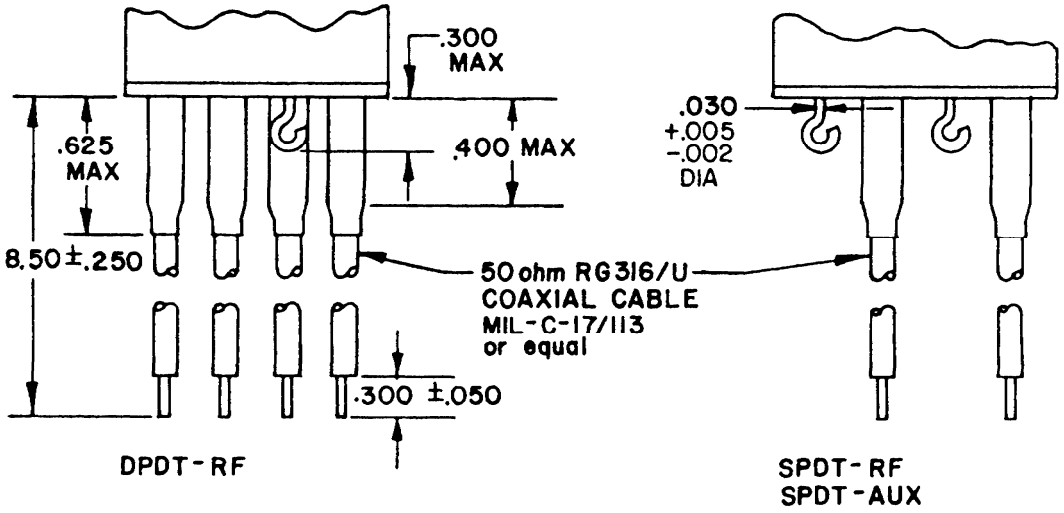
(E) denotes changes





CIRCUIT DIAGRAMS

FIGURE 1. Outline dimensions and configuration of relay - Continued.



TERMINAL CONFIGURATIONS

Inches	mm	Inches	mm	Inches	mm	Inches	mm
.002	0.05	.050	1.27	.290	7.37	.810	20.57
.005	0.13	.100	2.54	.300	7.62	.850	21.59
.015	0.38	.120	3.05	.400	10.16	1.062	26.97
.020	0.51	.165	4.19	.450	11.43	1.078	27.38
.030	0.76	.200	5.08	.600	15.24	1.320	33.53
.040	1.02	.250	6.35	.625	15.88	8.50	215.90

NOTES:
1. Dimensions are in inches.
2. Metric eqivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. The X1 terminal shall be identified with contrasting bead.
5. Shape of lug (solder) terminals optional.
6. Solder lugs shall be readily accessible to lead wires.
7. Terminal identification for reference only.
8. Coil symbol optional in accordnace with MIL-STD-1285.

FIGURE 1. Outline dimensions and configuration of relay - Continued.

REQUIREMENTS:

CONTACT DATA:

Arrangement: 1 form C or 2 form C (see table I).

RF Power handling capability: 1/

80 watts at 100 MHz.
50 watts at 500 MHz.
30 watts at 1,000 MHz.

Load rating (all contacts):

High level:

Resistive: 2 amperes at 28 V dc max.

Inductive: .5 ampere at 28 V dc max (200 mH).

Lamp: 0.160 ampere at 28 V dc.

Low level:

Resistive: 10 to 50 µA at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance and voltage drop:

	Auxiliary	Coaxial
(E) Initial:	.050 ohm max	.175 ohm max
High level:		
During life:	1.4 volts max	1.6 volts max
(E) After life:	.100 ohm max	.220 ohm max
Low level:		
During life:	33 ohms max	33 ohms max
(E) After life:	.150 ohm max	.250 ohm max
(E) Intermediate current:		
During intermediate current:	1 ohm max	---
(E) After intermediate current:	.300 ohm max	---

Contact bounce: 2.0 milliseconds (ms) maximum. (Applicable to failure rate level "L").

Contact stabilization time: 2.5 milliseconds (ms) maximum. (Applicable to failure rate level "M", "P", and "R").

Overload: 2 times rated dc.

1/ Qualification testing shall be in accordance with RF power handling capability as specified in MIL-S-3928 except at one of the three rated frequencies and power level.

RF (radio frequency) characteristics: 2/

	DC-100 MHz	101-500 MHz	501-1,000 MHz
Isolation (dB) (min):	47	33	27
VSWR (max): 3/	1.09:1.0	1.17:1.0	1.35:1.0
Insertion loss (dB) (max): 3/	.25	.50	.70

(E) COIL DATA: (See table I)

Duty rating: Continuous.

Operate time: 5 ms maximum over temperature range with rated coil voltage.

Release time: 5 ms maximum over temperature range from rated coil voltage.

ELECTRICAL DATA:

Characteristic impedance: 50 ohms nominal.

Insulation resistance: 1,000 megohms min at 100 V dc, except the resistance between coil and case at high temperature shall be 500 megohms, or greater.

Dielectric withstanding voltage (V ac):

Sea level:	Other terminals	Coaxial terminals
Between case, frame, or enclosure, and between all contacts in the energized and deenergized positions	1,000	500
Between case, frame, or enclosure and coil(s)	500	NA
Between all contacts and coil(s)	1,000	1,000
Between open contacts in the energized and deenergized positions	500	500
Between contact poles	1,000	1,000

Altitude:	Other terminals	Coaxial terminals
Between all terminals and case	350	200

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

Magnetic interference: Applicable.

(E) Vibration (sinusoidal): MIL-STD-202, method 204, (20 g's, 10 to 2,000 Hz). Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

(E) Vibration (random): MIL-STD-202, method 214, test condition IG. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts (Applicable to qualification and group C testing only).

2/ Tested in accordance with voltage standing wave ratio (VSWR), insertion loss, and isolation as specified in MIL-S-3928 using 50-ohm terminations and loads.

3/ Application note. Insertion loss and VSWR decrease as the cable is shortened. Typical values with 2-inch cable lengths are:

	100 MHz	500 MHz	1000 MHz
VSWR	1.03:1.0	1.05:1.0	1.08:1.0
Insertion loss	.1	.2	.3

(E) Shock (specified pulse): MIL-STD-202, method 213, test condition B (75 g's). Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

Acceleration: Applicable.

Seal:

Without cables: 1×10^{-8} atm cm^3/s maximum.

With cables: Not applicable.

Resistance to soldering heat: Applicable to solder lugs.

PHYSICAL:

Terminal strength:

Auxiliary terminals: 3 ±0.3 pounds pull.

Coaxial terminals: 5 ±0.5 pounds pull of center conductor; 10 pounds minimum applied radially at extremity of rigid cable connector.

(E) Solderability: Applicable to solder lugs.

Sealed by welding: Applicable.

Dimensions and configuration: See figure 1.

Termination: See figure 1 and table I.

Weight (with cables): .80 ounce max SPDT (22.5 g). 1.20 ounce max DPDT (34.0 g).

Identification marking (full): Applicable.

LIFE TEST REQUIREMENTS:

High level loads: 100,000 cycles.

(E) Low level loads: 100,000 cycles plus 900,000 cycles mechanical life (a minimum of two relays for each high and low level contact rating shall be tested).

PART NUMBER: M39016/33-(dash number from table I and suffix letter designating failure rate level).

QUALITY CONFORMANCE INSPECTION:

(E) Inspection of product for delivery (group A inspection): Subgroup 2 of group A test shall be performed prior to the assembly of coaxial cables. RF characteristics tests shall be conducted at 100 MHz only with subgroup containing visual and mechanical examination at general inspection level 1.
Periodic inspection (groups B and C): RF characteristics test shall be substituted for seal test and performed at all frequencies in groups B and C.

Ⓔ TABLE I. Dash number and characteristics. 1/

Dash number 2/ M39016/33 Mount				Contact arrangement	Coil voltage 4/ V dc		At 25°C				Over temperature range		
Flange C	Flange A	Flange B	No Mount		Rated	Maximum	Coil resistance ohms ±10%	Specified pick-up value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified drop-out value (voltage) (V dc)	Specified pick-up value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified drop-out value (voltage) (V dc)
-001	-007	-013	-019	2 Form C	26.5	32	700	13.5	8.0	1.5	18	14	1.0
-002	-008	-014	-020	1 Form C 3/	26.5	32	700	13.5	8.0	1.5	18	14	1.0
-003	-009	-015	-021	2 Form C	12	15	160	6.4	4.0	0.7	9.0	5.8	0.50
-004	-010	-016	-022	1 Form C 3/	12	15	160	6.4	4.0	0.7	9.0	5.8	0.50
-005	-011	-017	-023	2 Form C	6.0	7.5	40	3.2	2.0	0.35	4.5	2.9	0.25
-006	-012	-018	-024	1 Form C 3/	6.0	7.5	40	3.2	2.0	0.35	4.5	2.9	0.25

1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuit are not recommended for subsequent use in low level applications.

2/ The suffix letter L, M, P, or R to designate the applicable failure rate level that shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example, 001L - - - - 012R.

3/ One SPDT coaxial input and one SPDT auxiliary dc input.

4/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

Ⓔ TABLE II. Qualification inspection and sample size. 1/

Single submission	Group submission	
18 units plus 1 open unit for level L at C = 0. 2/	M39016/33-002	18 units plus 1 open unit for level L at C = 0. 2/
33 units plus 1 open unit for level M at C = 0. 2/		33 units plus 1 open unit for level M at C = 0. 2/
Qualification inspection as applicable 3/		Qualification inspection as applicable 3/
	M39016/33-009	6 units, qualification inspection group II. 3/
		4 units, power handling capability, capability, terminal strength, RF characteristics and visual and mechanical.
		2 units, shock, vibration, acceleration, and terminal strength.
	M39016/33-017	2 units, qualification inspection group II, plus shock, vibration, acceleration and terminal strength 3/

1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/6 may be used in addition to MIL-R-39016/33 data. Prior to performance of retention of qualification testing; the relay manufacturer shall preselect the sampling plan.

2/ The number of units required for qualification testing will be increased as required in group V, table II, MIL-R-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification inspection testing; the relay manufacturer shall preselect the sampling plan.

3/ RF characteristic measurement shall be substituted for seal test. Solderability test not applicable.

QUALIFICATION INSPECTION (REDUCED TESTING):If the relays produced for MIL-R-39016/33 are similar in construction and design, except for the coaxial terminations, to the relays produced for MIL-R-39016/6, then reduced testing for qualification of MIL-R-39016/33 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/6 relays. For reduced testing, see table III.

Ⓔ TABLE III. Qualification inspection (reduced testing).

Examination or test
8 each M39016/33-007 plus 1 open unit - Group II. 1/
2 M39016/33-007, shock, vibration, terminal strength, RF characteristics and visual and mechanical.
2 M39016/33-007, salt spray and RF characteristics.
4 M39016/33-007, RF power handling capability, terminal strength and RF characteristics.

1/ RF characteristic measurement shall be substituted for seal test. Solderability test not applicable.

CONCLUDING MATERIAL

Ⓔ Custodians:
Air Force - 85
Navy - EC

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5945-0775)